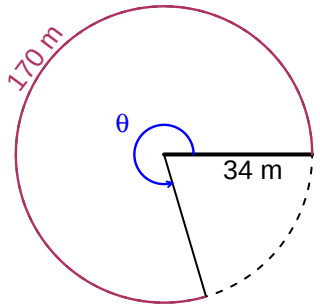
Name: Date:

Trig Final (Solution v40)

- You should have a calculator (like Desmos) and a unit-circle reference sheet.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The radius is 34 meters. The arc length is 170 meters. What is the angle measure in radians?

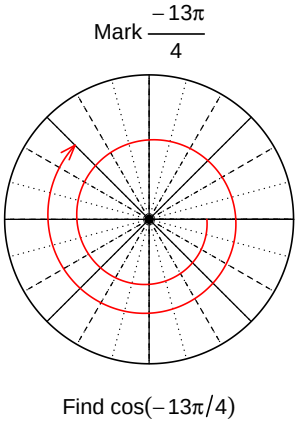


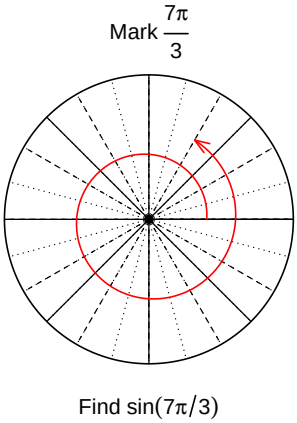
$$\theta = \frac{L}{r} \qquad r = \frac{L}{\theta} \qquad L = r\theta$$

$\theta = 5$ radians.

Question 2

Consider angles $\frac{-13\pi}{4}$ and $\frac{7\pi}{3}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\cos\left(\frac{-13\pi}{4}\right)$ and $\sin\left(\frac{7\pi}{3}\right)$ by using a unit circle (provided separately).





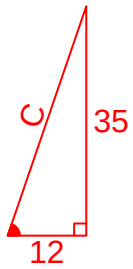
$\cos(-13\pi/4) = \frac{-\sqrt{2}}{2}$

$\sin(7\pi/3) = \frac{\sqrt{3}}{2}$

Question 3

If $\tan(\theta) = \frac{35}{12}$, and θ is in quadrant III, determine an exact value for $\sin(\theta)$.

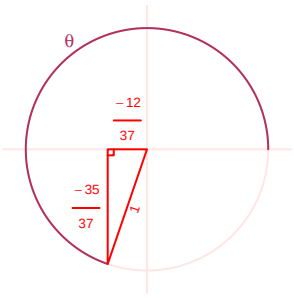
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



Solve the Pythagorean Equation

$$12^2 + 35^2 = C^2$$
$$C = \sqrt{12^2 + 35^2}$$
$$C = 37$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant III in a unit circle.



$$\sin(\theta) = \frac{-35}{37}$$

Question 4

A mass-spring system oscillates vertically with a frequency of 6.47 Hz, an amplitude of 7.54 meters, and a midline at $y = 4.18$ meters. At $t = 0$, the mass is at the maximum height. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = 7.54\cos(2\pi 6.47t) + 4.18$$

or

$$y = 7.54\cos(12.94\pi t) + 4.18$$

or

$$y = 7.54\cos(40.65t) + 4.18$$